RocketTeam

Project Raziel

Vehicle Specifications

Dimensions	Approx. 140” tall ; 6” diameter
Mass	69.7 pounds (with fuel grain)
Motor	M2500-T solid motor from Aerotech (98 mm, 4 grain case)
Material	Nose cone: Student built S-glass Body: Student Built S-glass tubes with post oven cured epoxy Fins: Carbon fiber reinforced foam

Main Parachute

Student designed and sewn 10’ diameter semi-elipsoidal with 3.2’ diameter spill hole

Structures

Simplicity: All tubes are attached to couplers at three points, making disassembly easy

Lightweight mass: 18.15lbs

Inspectability: A bolted internal structure ensures the fin can may be easily disassembled so all bonded joints can be inspected.

Serviceability: The fins are designed to be easily replaced as a potential consumable item for each flight.

Avionics Bay

3D printed and water jet construction for easy iteration and servicing, including custom designed Pyxida board and a TeleMetrum

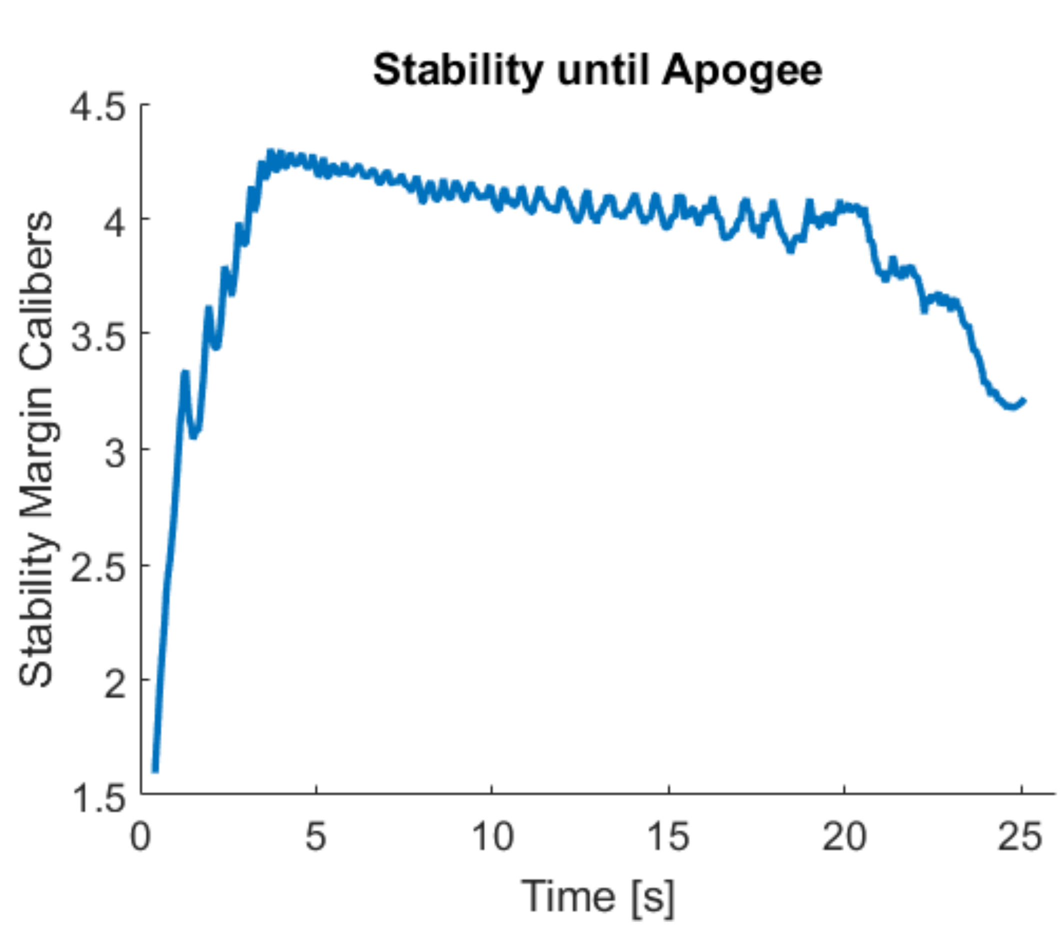
Drogue Parachute

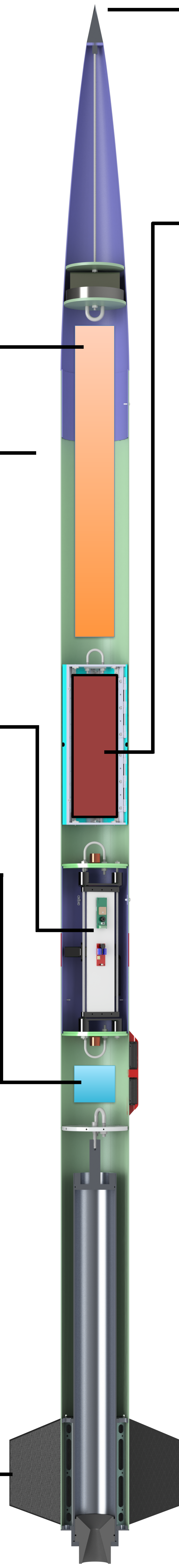
Student designed and sewn 2.9’ diameter semi-elipsoidal with 0.5’ diameter spill hole

Fins

Strength: The design point for fin strength comes from landing loads, rather than aerodynamic loads. We utilize a trapezoidal design to allow the rocket to gently fall over on landing, therefore decreasing the shock the fins must absorb.

Stability: The fins are sized so the rocket has a stability margin of at least 1.5 caliber after leaving the launch rail. The plot below shows an analysis of the stability margin of our rocket created with the program OpenRocket.





Nose Cone

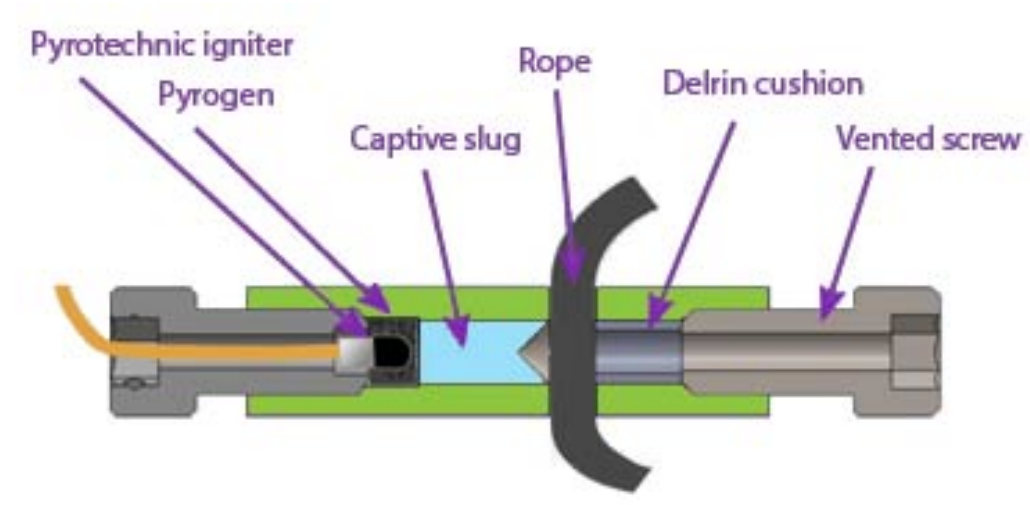
Design: 6” diameter 5.5:1 Von Karman

Ballast: The nose cone houses the main ballast compartment. Ballast can be added or subtracted in 5oz increments based on launch day weather and launch site elevation. Additional ballast can be added above the motor case to ensure a well balanced rocket.

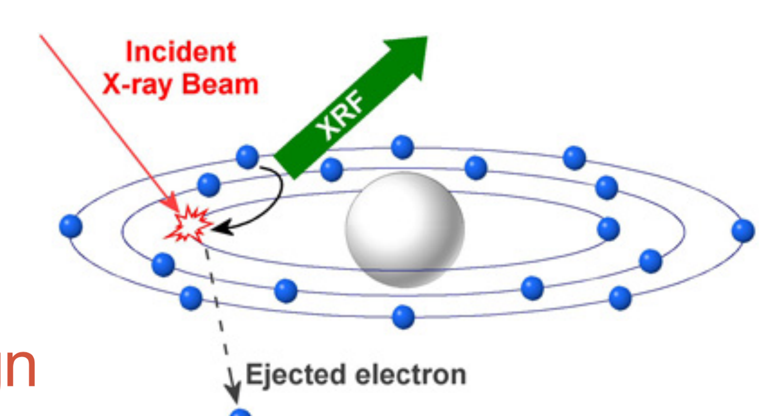
Payload

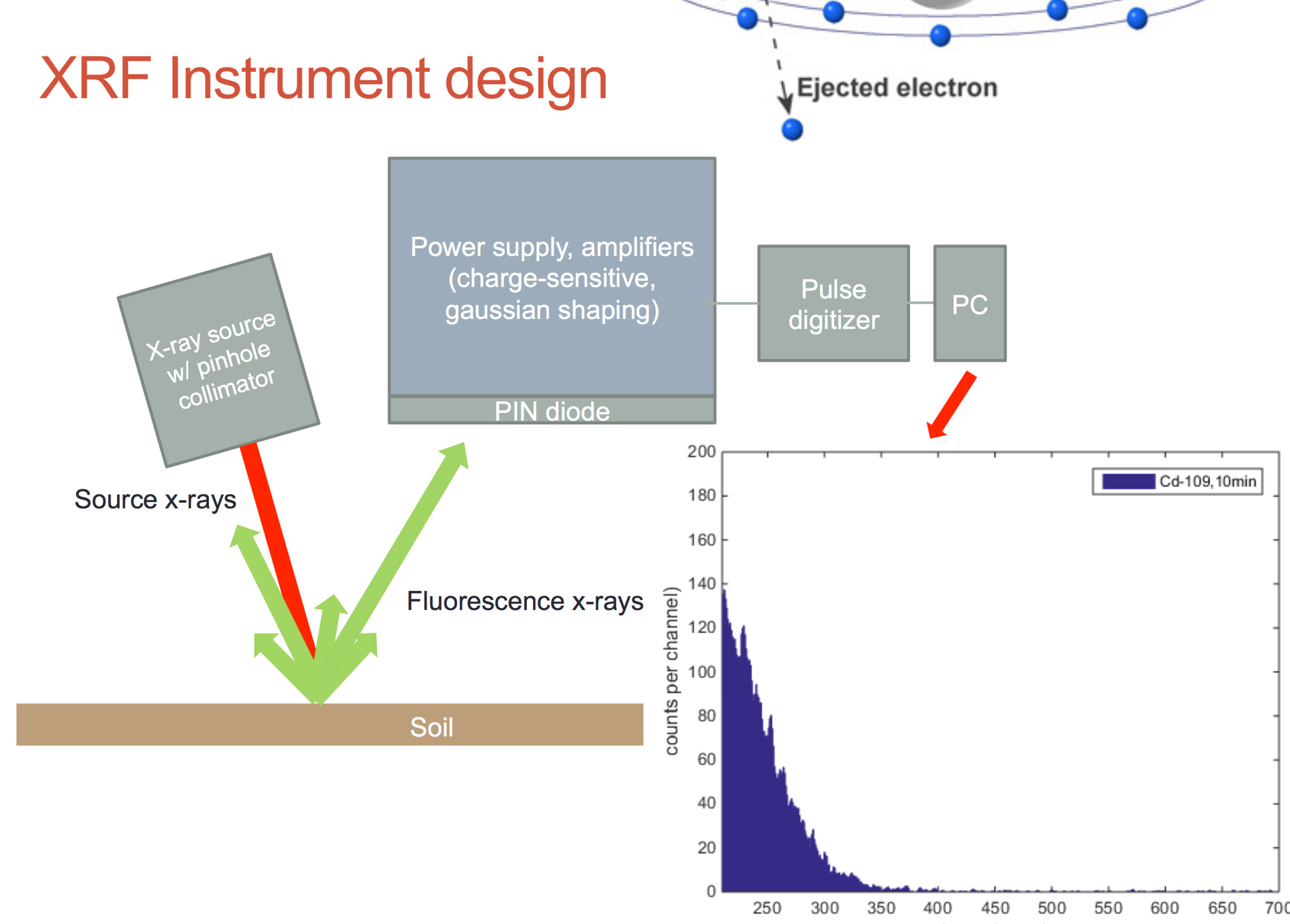
Goal: Deploy an x-ray fluorescence (XRF) sensor to detect heavy metal levels in foreign soil.

Deployment: The payload is housed within a fiberglass over-wrapped foam sabot. This sabot is spring loaded but held closed with a pyrotechnic rope cutter (see diagram below) until the rocket reaches the ground. A beach ball containing the XRF sensor and a CO_2 based inflation mechanism deploys, orienting the XRF sensor.



X-ray Fluorescence Experiment: X-ray fluorescence (XRF) is a process by which x-rays or gamma rays incident on an atom cause the re-emission of “characteristic” x-rays. These “characteristic” x-rays are unique to each element. XRF is an attractive sensing approach for rovers and planetary missions, as it can produce results with low power consumption, mass, and cost.





Beach Ball: The beach ball has one job: ensure the XRF sensor points towards the ground. The sensor is mounted to the skin of the ball, so that upon inflation the ball automatically orients the sensor. The beach ball features a bespoke mechanism for puncturing a small CO_2 canister for self inflation. This allows the entire apparatus to fit inside the 4”x4” cubesat dimension during launch, but expand to a 10” diameter ball upon landing.